

lake, distant twenty miles from this place, were distinctly seen on the 17th; the phenomenon lasted thirty minutes.

Mirage were also observed as follows: Yuma, Ariz., 3d, 10th; Fort Bidwell, Cal., 2d; San Diego, Cal., 17th; Webster, Dak., 2d, 3d, 5th, 6th, 8th, 13th, 29th; Woonsocket, Dak., 7th, 10th; Lake Forest, Ill., 30th; Hampton, Iowa, 10th, 11th; Marquette, Nebr., 4th, 8th, 29th to 31st; Green Bay, Wis., 7th.

SAND STORMS.

Sand storms were reported as follows:

San Carlos, Ariz., 18th, 19th; Dodge City, Kans., 18th, 31st; Keeler, Cal., 21st.

SUN SPOTS.

Sun spots were observed during the month as follows:

Mr. John W. James, Riley, McHenry Co., Ill.: reports that no sun spots were visible during the month.

Mr. H. D. Govey, North Lewisburgh, Champaign Co., Ohio: the sun spots observed on the 25th were the only ones seen during the month.

Mr. M. A. Veeder, Lyons, Wayne Co., N. Y.: 2d, faculae appeared by rotation; 24th, spots formed west of sun's meridian.

Prof. F. P. Leavenworth, director, Haverford College Observatory, Pa. (observed by Mr. H. V. Gummere, assistant):

Date, October, 1888.	Number of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Faculae.		Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	
1, 4 p. m.	0	0	1	1	0	0	0	0	0	0	Through clouds. *
2,	0	0	0	0	0	0	0	0	0	0	Definition very poor.
3, 10 a. m.	1	1	0	0	0	0	1	1	0	0	
4, 3 p. m.	0	0	0	0	0	0	0	0	0	0	
5, 4 p. m.	0	0	0	0	0	0	0	0	0	0	
8, 3 p. m.	0	0	0	0	0	0	0	0	0	0	Definition poor.
9, 9 a. m.	0	0	0	0	0	0	0	0	0	0	
10, 4 p. m.	0	0	0	0	0	0	0	0	0	0	Definition good.
13, 11 a. m.	0	0	0	0	0	0	0	0	0	0	Definition poor.
15, 9 a. m.	0	0	0	0	0	0	0	0	0	0	Do.
16,	0	0	0	0	0	0	0	0	0	0	Definition good.
17, 9 a. m.	0	0	0	0	0	0	0	0	0	0	Definition very good; faint.
20, 9 a. m.	1	2	0	0	1	2	1	1	1	5	Definition poor.
24, 10 a. m.	0	0	0	0	0	0	0	0	0	0	Definition very good.
25, 4 p. m.	2	17	0	0	0	0	17	2	2	0	Definition good.
29, 10 a. m.	0	0	0	0	0	0	0	0	0	0	Definition very poor.
30, 10 a. m.	0	0	0	0	0	0	0	0	0	0	Definition good.
31, 10 a. m.	0	0	1	1	0	0	0	0	0	0	Definition good.

* Observed by Prof. F. P. Leavenworth.

VERIFICATIONS.

INDICATIONS FOR 24 HOURS IN ADVANCE.

The percentages of verifications of the 8 p. m. daily indications for October, 1888, as determined from comparison of succeeding telegraphic reports, are given in the table below.

The predictions for districts east of the Rocky Mountains for October, 1888, were made by Professor Cleveland Abbe, and those for the Pacific Coast districts were made at San Francisco, Cal., by 2d Lieutenant J. E. Maxfield, Signal Corps; the verifications for all districts were determined by Assistant Professor C. F. Marvin.

Percentages of indications verified, October, 1888.

States.		States.	
Maine	76.3	Tennessee	74.0
New Hampshire	75.8	Kentucky	76.9
Vermont	73.9	Ohio	67.0
Massachusetts	75.5	West Virginia	68.2
Rhode Island	77.4	Indiana	74.8
Connecticut	78.2	Illinois	75.1
Eastern New York	75.5	Lower Michigan	76.5
Western New York	73.0	Upper Michigan	74.5
Eastern Pennsylvania	74.6	Wisconsin	73.2
Western Pennsylvania	67.5	Minnesota	71.9
New Jersey	77.3	Iowa	74.4
Delaware	76.1	Kansas	71.7
Maryland	74.8	Nebraska	76.1
District of Columbia	77.0	Missouri	78.8
Virginia	78.0	Colorado	71.0
North Carolina	83.0	Eastern Dakota	74.2
South Carolina	85.7	Southern California*	93.7
Georgia	84.3	Northern California*	91.9
Eastern Florida	76.0	Oregon*	78.1
Alabama	74.8	Washington Territory*	77.9
Mississippi	80.6	By elements: Weather	80.5
Louisiana	78.1	Temperature	68.4
Texas	74.5	Monthly percentage of weather and temperature combined †	75.7
Arkansas	78.8		

* In determining the general percentage for the different elements the Pacific coast states are not included. † The monthly percentage of weather and temperature combined is determined by multiplying the percentage of weather by 6, and the percentage of temperature by 4, and dividing their sum by 10.

combined is determined by multiplying the percentage of weather by 6, and the percentage of temperature by 4, and dividing their sum by 10.

CAUTIONARY SIGNALS FOR OCTOBER, 1888.

Statement showing percentages of justifications of wind signals and cold-wave signals for the month of October, 1888:

Wind signals.—Total number of signals ordered, one hundred and seventy-three. Number of cautionary signals ordered, one hundred and sixty-nine; justified, wholly or in part, ninety. Number of storm signals ordered, four; justified, three. Number of signals ordered for easterly winds, eighty-four; justified, seventy-eight. Number of signals ordered for westerly winds, eighty-nine; justified, seventy-nine. Number of signals ordered late, ten. Number of storms without signals, twenty-three. Percentage of justifications, 62.3.

Cold-wave signals.—Total number of signals ordered, one hundred and thirty-two; justified, wholly or in part, forty. Number of severe cold-waves without signals, twelve. Percentage of justifications, 27.4.

LOCAL VERIFICATIONS.

The following extracts from the published reports of the state weather services for October, 1888, show the percentages of verifications of weather and temperature signals:

Nebraska.—The percentages of correct predictions for the state were: temperature, 89.7; weather, 82.1; mean, 85.9.

Ohio.—The percentages of verifications of weather signals (received from Washington and distributed to thirty-two stations) were: weather, 75; temperature, 80.

South Carolina.—The percentages of verifications for the state were: weather, 86.5; temperature, 84.5.

Tennessee.—The percentages of verifications of weather and temperature predictions for the month at the following stations were: Jonesborough, weather, 90.0; temperature, 96.8. Clarksville, weather, 85.2; temperature, 63.0. Pulaski, weather, 80.0; temperature, 80.0. Burkesville, weather, 92.0; temperature, 100.0.

STATE WEATHER SERVICES.

[Temperature in degrees Fahrenheit; precipitation, including melted snow, in inches and hundredths.]

The following extracts are republished from reports for October, 1888, of the directors of the various state weather services:

ALABAMA.

From the 1st to the 13th the sky was overcast with heavy clouds and the weather was generally threatening, with high temperature, and low pressure. The second period of low pressure, from the 19th to the 26th, produced heavy rains over the entire state, with correspondingly high temperature. The clear

and fair days of the month generally occurred on those days when high pressure waves were crossing the state.

The average temperature was 5.5 below the normal. The average precipitation was 1.29 above the normal. The month was generally mild with but few cool days, and the frosts that occurred were light.

Summary.

Temperature.—Monthly mean, 61.6; highest monthly mean, 66.3, at Troy; lowest monthly mean, 54.6, at Valley Head; maximum, 87, at Eufaula, 5th; minimum, 80, at Valley Head, 18th; range for state, 57; greatest local monthly range, 49, at Valley Head; least local monthly range, 34, at Troy.
Precipitation.—Average for the state, 4.44; greatest, 8.53, at Union Springs; least, 2.15, at Tuscaloosa.
Wind.—Prevailing direction, north.—*P. H. Mell, Signal Corps, Auburn, director.*

ARKANSAS.

The temperature was generally below the average for the same month of last year. The rainfall was in excess of the October, 1887, amount. Some frosts were reported, the dates of their most frequent occurrence being the 18th, 20th, and 24th; they were not, however, general, and in some portions of the state there was no frost.

Summary.

Temperature.—Monthly mean, 59.1; highest monthly mean, 64, at Texarkana; lowest monthly mean, 56, at Alexander; maximum, 88, at Portia; minimum, 82, at Alexander, Devall's Bluff, and Portia; range for state, 56; greatest local monthly range, 56, at Portia; least local monthly range, 26, at Dallas.
Precipitation.—Average for the state, 2.02; greatest, 4.60, at Ozone.—*Prof. John C. Branner, Little Rock, director; W. U. Simons, Corporal, Signal Corps, assistant.*

ILLINOIS.

The temperature was considerably below the average of preceding Octobers, but was more equable than usual. The warmest days were the 1st and 31st, and the coolest day the 8d. There were occasional frosts, but none very severe, and, as a whole, the month was very favorable for agricultural operations and for vegetation generally.

Summary.

Temperature.—The mean temperature of the state was 50.7, which was 4 below the mean for the past ten years. The mean of the northern division was 47.8; the central division, 50.9, and the southern division, 53.3.
Precipitation.—The rainfall was not far from the average—in some districts above and in others below. There was a very heavy general rain on the 18th, on which date the greater part of the whole month's rain fell. The greatest deficiency, 2.37, occurred at Sycamore, and the greatest excess, 2.58, at Pana. Among the heaviest rainfalls reported on the 18th were: Philo, 3.60; Atwood, 8.12, and Lacon, 2.69. There were several daily rainfalls of over one inch; the largest being 2 at Pana on the 5th. Thunder-storms were not numerous or severe. Frosts were numerous but not severe.
Wind.—Prevailing direction, southwest.—*Col. Charles F. Mills, Springfield, director; James Cassidy, Sergeant, Signal Corps, assistant.*

INDIANA.

Although no excessively low temperatures or very abrupt changes occurred, the mean for the month was about five degrees below the normal, and the lowest noted since 1871, and probably earlier. Corresponding to the lowest and highest barometric areas, the highest means were noted on the 1st, and the lowest on the 21st; the maximum and minimum temperatures, at most stations, were also noted on those dates, respectively, except in the central portion of the state, where the lowest readings occurred on the 8d, with a sudden and excessive rise in pressure, when ice and killing hoar-frost were formed, and on the 21st in the southern and northern portions during the highest barometric pressure.
Rain fell quite frequently during the month, and the amount measured was quite abundant, and about 1.13 in excess of the normal amount for October. The heaviest measurements were recorded in the southern and central portions from the 18th to 22d, and in the northern portion on the 18th and 19th. The ample precipitation was very beneficial to the wheat crop and to grass. Spits of snow, the first of the season, were reported from Worthington and Angola. Hail fell only at a few isolated places during the thunder-storms of the 1st and 18th. Hoar-frost occurred frequently nearly everywhere throughout the state during the month.

Summary.

Temperature.—Monthly mean, 49.3; highest monthly mean, 56.2, at Mount Vernon; lowest monthly mean, 44.9, at Maury; maximum, 80, at La Fayette, 1st; minimum, 24, at Maury, 8d, 21st; range for state, 56; greatest local monthly range, 64, at La Fayette; least local monthly range, 39, at Blue Lick.
Precipitation.—Average for the state, 3.50; greatest, 5.97, at Richmond; least, 1.56, at Columbia City; greatest daily rainfall, 2.79, at Richmond, 18th.
Wind.—Prevailing direction, southeast and southwest.—*Prof. H. A. Huston, La Fayette, director; C. F. R. Wappenhans, Sergeant, Signal Corps, assistant.*

IOWA.

The month was cool and dry, northwesterly winds prevailing. The mean temperature was 1.3 below the normal, a small deviation from normal for a fall month. The first two decades were decidedly cold, being 4 below normal,

while the last decade was warm, being 3 above normal. The coldest days were the 2d and 3d, and the three days from the 20th to the 22d averaged about 10 below normal. The last two days of the month were quite warm, especially the last day, which, being over 20 above normal and thus having the normal temperature of the beginning of September, preceded the noted storm of November 1st.
The mean cloudiness was nearly normal, but the middle decade was the most cloudy and had the most frequent precipitation, which was, however, either light or local. Rain fell in the west on three days, and in the east on five days during the month. The total amount of precipitation was less than one inch in the south, west, and northwest; it exceeded one inch in the southwest, centre, and the east sections. In the territory extending from Buchanan and Linn to Jackson counties, the total rainfall was greatest, exceeding two inches. The greatest precipitation fell on the 10th and 11th in central Iowa; on the 14th in the west, and on the 18th in the east, where from Iowa to Buchanan counties, and eastward, it exceeded one inch. The first snow of the season fell on the 19th in northeastern Iowa, and on the 21st, except in the extreme east and southeast, the fall being extremely light. A thunder-storm was quite extended over the state on the 17th and 18th, and over eastern Iowa on the 26th. Light hail was associated with these storms in a few places. No destructive winds were reported. Fog extended over the state on the 14th, and over eastern Iowa on the 27th. Halos were seen on the 9th in the northeast, and on the 20th in the southwest. The northern lights were seen in eastern Iowa on the 30th.—*Gustavus Hinrichs, Iowa City, director.*

KANSAS.

The deficiency in temperature occurring in August and extending through September has continued in the eastern and middle divisions and the southwestern portion of the western division, the greatest deficiency occurring in Shawnee and the counties to the north and northeast, and ranging from 3 to 6 below the October normal. An excess occurred in Russell and extended southwest through Rush, Ness, Hodgeman, Garfield, and Gray into Haskell. There was an excess of precipitation in Marshall, which extended thence southeast through Pottawatomie, Jackson, Jefferson, northern part of Douglas, and southern part of Leavenworth into Johnson. An excess again occurred in Crawford and Cherokee and west through Labette, Montgomery, and Chataqua into the southern parts of Cowley and Sumner. Throughout the rest of the state there was a deficiency, which was greatest from Reno to Osborne, extending southwest to Ness, Hodgeman, and Ford, thence, with constantly narrowing limits, west to Greeley, while in Wallace and the extreme southwestern counties it was nearly normal.

Summary.

Temperature.—Monthly mean, 55.6; highest monthly mean, 59.6, at Santa Fé; lowest monthly mean, 47.5, at Montero; maximum, 91, at Lebo, 4th; minimum, 20, at Cawker City (six miles northwest of Concordia), 20th; range for state, 71; greatest local monthly range, 65, at Lebo; least local monthly range, 45, at Montero; greatest daily range, 50, at Debo, 29th; least daily range, 2, at Lebo and Seneca, 14th.
Precipitation.—Average for the state, 1.53; greatest, 3.74, at Lawrence; least, 0.12, at Kanopolis.
Wind.—Prevailing direction, south.—*Prof. J. T. Lovewell, Topeka, director; T. B. Jennings, Sergeant, Signal Corps, assistant.*

KENTUCKY.

Summary.

Temperature.—Monthly mean (eight stations), 52.3; highest monthly mean, 54.5, at Owenton; lowest monthly mean, 50.4, at Lexington; maximum, 83, at Whitesburg, 27th; minimum, 28.7, at Frankfort, 21st; range for state, 54.8; greatest local monthly range, 50.2, at Frankfort; least local monthly range, 39, at Millersburg.
Precipitation.—Average (nine stations), 3.45; greatest, 7.58, at Whitesburg; least, 1.09, at Madisonville.—*Under direction of the State Polytechnic Society, Louisville; Frank Burke, Sergeant, Signal Corps, assistant, in charge.*

LOUISIANA.

The temperature was less than a degree below the normal for the same month of the past eighteen years. The deficiency occurred in the first half of the month, the latter portion being warmer than usual.
The general rain of the 22d broke a drought of a month's duration, and was very badly needed for the sugar and vegetable interests. There was about the average amount of sunshine received, being most during the early part of the month at the time of the cool weather, and the effects on the agricultural interests were very beneficial.
Light frosts occurred in the northern part of the state on the 28th and 31st, and in Avoyelles and Saint John Baptist parishes during the second week of the month, but were so light as to be scarcely noticeable.

Summary.

Temperature.—Monthly mean, 66.6; highest monthly mean, 72.5, at Abbeville and Shell Beach; lowest monthly mean, 61.1, at Vidalia; maximum, 92, at Liberty Hill, 2d; minimum, 38, at North Louisiana Experiment Station, 28th and 29th; range for state, 59; greatest local monthly range, 54, at Liberty Hill; least local monthly range, 28, at Shell Beach; greatest daily range, 48, at

Liberty Hill, 4th, 29th, 30th; least daily range, 1.5, at Crowley, 23d; mean daily range for the state, 20.3.

Precipitation.—Average for the state, 8.55; greatest, 7.36, at New Orleans; least, 0.54, at Coushatta; greatest daily rainfall, 4.13, at New Orleans, from night of 22d to night of 23d.

Wind.—Prevailing direction, north.—*R. E. Kerkam, Sergeant, Signal Corps, New Orleans, in charge.*

MICHIGAN.

The mean temperature for the month, 44.8, was 4.8 below the normal for thirteen years. The temperature was below the normal in all sections. The mean daily temperature was above the normal on five days, and below on twenty-six. The highest mean daily temperature, 58, occurred on the 31st, when the temperature was 14 above the normal, and the lowest, 37, on the 20th, when the temperature was 10 below the normal. The highest mean daily temperature for the past thirteen years, 72, occurred on the 1st, in 1878, and on the 6th, 7th, and 10th, in 1879, and the lowest, 30, on the 29th, in 1887. The highest monthly mean temperature, 57.6, occurred in 1879, and the lowest, 44.1, in 1887. The maximum temperature, 76, occurred on the 31st, at Petersburg, and the minimum, 21, on the 9th, at Birmingham.

The average precipitation, 2.29, was 1.01 below the normal of thirteen years. The precipitation was below the normal in all sections; the greatest deficiencies occurred in the northern, and the least in the southern, section. General rains fell on the 1st, 5th, 6th, 7th, 12th, 13th, 15th, 16th, 18th, 19th, 22d, 26th, and 27th, and local rains on the 2d, 3d, 4th, 8th, 14th, 17th, 20th, 21st, 23d, 24th, 28th, and 31st. The largest precipitation for October during the past twelve years was 6.40, in 1881, and the smallest, 2.11, in 1879. Thunder-storms were reported on seven days. Light snow was generally reported on the 19th and 20th. The largest snowfall, eight inches, was reported at Calumet. There was no snow on the ground at the close of the month.

Summary.

Temperature.—Monthly mean, 44.8; highest monthly mean, 49.3, at Albion; lowest monthly mean, 37.7, at Atlantic; maximum, 76, at Petersburg, 31st; minimum, 21, at Birmingham, 9th; range for state, 55; greatest local monthly range, 51.5, at Adrian; least local monthly range, 28, at Bronson; greatest daily range, 40, at Hart, 10th; least daily range, 1.6, at Sault de St. Marie, 1st.

Precipitation.—Average, 2.29; greatest, 3.84, at Gulliver Lake; least, 0.78, at Grand Rapids.

Wind.—Prevailing direction, southwest.—*N. B. Conger, Sergeant, Signal Corps, Lansing, director.*

MINNESOTA.

October, like the preceding month, was characterized by a deficiency in rainfall and a slight deficiency in temperature. The month was about three degrees cooler than is usual for October, and there was little more than one-half the usual rainfall. The first light snow of the season occurred on the 19th; this was eight days later than the date of the first snow of last year. In the southeastern counties snow fell in sufficient quantities on the 27th to fully cover the ground.

Summary.

Temperature.—Monthly mean, 42.6; highest monthly mean, 45.8, at Mankato; lowest monthly mean, 38.3, at Pokegama Falls Dam; maximum, 76, at Saint Vincent and Medford, 7th; minimum, 18, at Pokegama Falls Dam, 5th; range for state, 58; greatest local monthly range, 57, at Saint Vincent; least local monthly range, 41, at Red Wing; greatest daily range, 42.7, at Saint Vincent, 6th; least daily range, 3.2, at Saint Vincent, 11th, 19th.

Precipitation.—The average for the state, 1.88; greatest, 2.37, at Leech Lake Dam; least, 0.42, at Grand Meadow.

Wind.—Prevailing direction, northwest.—*Prof. W. W. Payne, Northfield, director; John Healy, Private, Signal Corps, Saint Paul, assistant.*

MISSISSIPPI.

The weather during the month was unusually mild; the minimum temperature that occurred, 38, being 10 higher than the minimum temperatures reported during October in 1886 and 1887. The average rainfall was 0.38 in excess of the normal. The rainfall was well distributed, but occurred so frequently as to interfere with and retard cotton picking in many sections.

Summary.

Temperature.—Monthly mean, 64; highest monthly mean, 68, at Biloxi and Pearlinton; lowest monthly mean, 59, at Memphis, Tenn., and Holly Springs; maximum, 88, at Brookhaven, 17th, and Hazlehurst and Port Gibson, 5th; minimum, 38, occurred at five stations; range for state, 50; greatest local monthly range, 48, at Meridian; least local monthly range, 29, at Biloxi; greatest daily range, 41, Macon, 21st; least daily range, 1, at Pearlinton, 23d.

Precipitation.—Average for the state, 2.77; greatest, 6.12, at Lake; least, 0.28, at Hazlehurst. Average number of days on which rain fell, 6.—*Prof. R. B. Fulton, University, director; M. J. Wright, jr., Sergeant, Signal Corps, assistant.*

MISSOURI.

The mean temperature for October was 52.9. The highest temperature reported in the state was 89, at Lamonte, and the lowest, 24, at Ironton.

The average maximum temperature was 83.8, and the average minimum temperature, 31.1, making an average range of 52.7. The highest temperatures occurred on the 7th, 17th, and 18th, and the lowest on the 3d, 20th, and 21st. Frost was reported at nearly all stations on the 3d, 14th, 20th, and 28th. Many stations reported light frost on the 17th, 21st, and 23d.

Average precipitation, 2.62, which was less than the October normal. The greatest amount reported was 5.07, at Springfield, and the least, 0.57, at Frankford. In the state, as a whole, rain fell on twenty-three days. The greatest number of days of rain at any one place was fourteen at Cairo, Ill.

Thunder and lightning occurred on the 1st, 4th, 5th, 10th, 11th, 14th, 15th, 17th, 18th, 19th, and 26th. The thunder-storms on the 4th, 14th, and 18th extended over almost the entire state.—*Prof. Francis E. Nipher, Saint Louis, director; G. A. Weber, Sergeant, Signal Corps, assistant.*

NEBRASKA.

The month has been cool and dry and following, as it has, an extended period of drought it leaves the ground in an unfavorable condition for winter, as regards the safety of small fruit.

Summary.

Temperature.—The mean for October in southeastern Nebraska is 49.6. This is 3 below the normal, the means for the past eleven years ranging from 48.6 to 60.7. The maximum for the month, 86, has been about as usual, the minimum, 12; is lower than for any past October, except in 1887.

Precipitation.—The precipitation for the month has been small; less than an inch for the northern and western parts of the state; from one to two inches generally south of the Platte and over two inches in the extreme southeastern part of the state. The October precipitation has not been so small since 1878. A slight fall of snow occurred very generally throughout the state on the 21st. The number of clear and cloudy days has been about normal; the number of rainy days, like the precipitation itself, deficient.—*Prof. Goodwin D. Swezey, Crete, director; G. A. Loveland, Corporal, Signal Corps, assistant.*

NEW ENGLAND METEOROLOGICAL SOCIETY.

Summary.

Temperature.—Monthly mean, 44.2 (ninety-nine stations); highest monthly mean, 49.8, at Newport, R. I.; lowest monthly mean, 36.9, at Mayfield; maximum, 74, at Colchester, on the 18th; minimum, 8, Berlin Falls, on the 28d; range for New England, 66; greatest local monthly range, 68, at Berlin Falls; least local monthly range, 21, at Belfast; greatest daily range, 57, at Berlin Falls, on the 23d; least daily range, 0, at Concord, N. H., on the 9th, Rowe on the 19th, Woonsocket on the 1st, 12th, 27th.

Precipitation.—Average for New England, 5.89 (125 stations); greatest, 9.92, at Walpole; least, 2.37, at Block Island.

Wind.—Prevailing direction, northwest (17 stations).—*Prof. William H. Niles, Boston, Mass., president; Prof. Winslow Upton, Providence, R. I., secretary; Park Morrill, Sergeant, Signal Corps, assistant.*

NEW JERSEY.

The mean temperature for October, 1888, 49.2, is 5.2 below the average determined from the past records of fifty stations. The warmest days of the month were the 1st, 2d, 5th, and 6th, and the coldest the 4th, 10th, 11th, 22d, 30th, and 31st. The average rainfall for the state, 4.73, is 1.54 above the average determined from past records of forty-eight stations. The average number of days upon which rain fell, 11.6.

Summary.

Temperature.—Monthly mean, 49.2; highest monthly mean, 54.3, at Ocean City; lowest monthly mean, 44.0, at Hanover; maximum, 76.0 at Clayton, on the 1st; minimum, 24.0, at Hanover, on the 10th, 11th, 31st; range for state, 51.0; greatest local monthly range, 44.0, at Clayton; least local monthly range, 30.0, at Billingsport; greatest daily range, 34.4, at Egg Harbor City, on the 21st; least daily range, 0.5, on the 24th, at Egg Harbor City.

Precipitation.—Average for the state, 4.73; greatest, 7.00, at Ocean City; least, 2.97, at Freehold.

Wind.—Prevailing direction, northwest.—*Prof. George H. Cook, New Brunswick, director; E. W. McGann, Sergeant, Signal Corps, assistant.*

NEW YORK.

Summary.

Temperature.—The highest temperature for the month was 75, at Humphrey; lowest, 22, at Utica, 11th. The mean monthly temperature for the entire state was 48, the 5th being the hottest day and the 21st the coldest, while the general temperature of the state has been below the normal.

Precipitation.—The amount of rainfall has been larger than usual, the average for the state being 4.04; all stations, but Boyd's Corners, Erie (Pa.), and Palermo, reporting excessive rain. The greatest rainfall was 2.11, at White Plains, 6th. Daily rains have been reported in the state, excepting on the 25th and 26th. The average number of days on which 0.01 or more fell, was sixteen. Hail fell on the 2d, 3d, 8th, and 16th. Snow fell on the 3d, 20th, 29th, and 30th. Frosts were of frequent occurrence.

Wind.—Prevailing direction, northwest.—*Prof. E. A. Fuytes, Ithaca, director; I. W. Brewer, Private, Signal Corps, assistant.*

NEVADA.

Summary.

Temperature.—The temperature generally was high for the season, especially up to the 20th of the month. The highest reported is 100.4, at El Dorado Canyon, 12th, and the next highest, 85.8, at Carson City, 11th. The lowest reported is 17.5, at Tuscarora, 25th, and the next lowest, 18.8, at Carson City, 22d. The warmest part of the month was from the 11th to the 15th, and the coldest from the 20th to the 26th. The means ranged from 50 to 57, excepting at Rioville and El Dorado Canyon, in Lincoln county. The mean at Winnemucca and Carson City was 51.2. Carson City reports the highest mean temperature in eight years. On the 14th the mercury fell to 7 at Elko. A slight cold wave visited Virginia City and lasted from the 18th to the 24th. The temperature was such at the end of the month that the trees shed their leaves and vegetation assumed a wintry appearance.

Precipitation.—No snow was reported except a light fall at Virginia City on the 1st, and very little rain, and that was confined to Lander and the adjoining counties, and occurred on the 1st and 2d, except as follows: Heavy rain at Tuscarora during severe thunder-storm on the 1st. 4th, during a thunder-storm a cloud burst over Elko and tons of water fell upon the town, causing general consternation. "The Central Nevadan" of October 4th says: "Heavy rains in Reese River Valley have caused Reese River to rise; the water is now within three miles of town, and the probabilities are that before another day the Reese will empty into the Humboldt. The Reese usually sinks in the sand when still fifty miles from the Humboldt. Only twice in thirty years has it been known to reach the latter river."

Wind.—Prevailing direction, northeast.—*Prof. Charles W. Friend, Carson City, director; E. H. Thompson, Private, Signal Corps, assistant.*

NORTH CAROLINA.

Summary.

Temperature.—Monthly mean, 57; highest monthly mean, 62.9, at Southport; lowest monthly mean, 52.1, at Knoxville, Tenn.; maximum, 83, at Cheraw, S. C.; minimum, 32.5, at Mount Pleasant; range for state, 50.5.

Precipitation.—Mean monthly rainfall, 4.55; greatest monthly rainfall, 7.09, at Mount Pleasant; least, 1.81, at Chapel Hill.

Wind.—Prevailing directions, southwest and northwest.—*Dr. Herbert B. Battle, Raleigh, director; H. McP. Baldwin, Sergeant, Signal Corps, assistant.*

OHIO.

Summary.

Temperature.—This was the coldest October since the opening of the bureau in 1882. The mean temperature of the northern section was 46.8; of the middle section, 47.4; and of the southern section, 49.4. These means are 8.6, 8.8, and 4.0 below the six-year averages for the sections. The mean for the state, 47.9, was 3.8 below the average. The average daily range of temperature, 17.1, is the smallest for October since 1883. The maximum temperature, 80, occurred at North Lewisburg on the 1st, and the minimum, 22.0, at New Comerstown on the 18th and 20th. Killing frost was general in all sections on the 8d, 9th, 10th, 18th, 21st, and 30th.

Precipitation.—General rains occurred in all sections on the 1st, 5th, 6th, 12th, 18th, 15th, 16th, 19th, 22d, 23d, and 28th; in the northern section on the 2d, 7th, 8th, 14th, 20th, 24th, 27th, and 28th; in the middle section on the 7th, 8th, 11th, 17th, and 27th; and in the southern section on the 2d, 12th, and 20th. Snow was reported from the northern section on the 2d, 12th, and 20th, and from the middle section the 20th. Mr. Moses Craig, Ohio State University, reports a violent gale from the west at five p. m. of the 1st, accompanied by heavy rain and some hail. He also reports rain from a cloudless sky on the evening of the 7th. The mean rainfall for the northern section was 2.51; for the middle section, 2.68; for the southern section, 2.84; and for the state, 2.68. These means are 0.43, 1.66, 1.81, and 1.80 above the six-year average. More rain fell during the month than in any October since 1883. The greatest monthly rainfall was 5.99, at Sidney, and the least, 1.64, at Toledo.—*Prof. B. F. Thomas, Columbus, director; Lieut. Charles E. Kilbourne, secretary; C. M. Strong, Private, Signal Corps, assistant.*

PENNSYLVANIA.

Summary.

Temperature.—The mean temperature for the month of October was 46.1, which is about 6 below the average, and largely increases the temperature deficiency since January 1st. The highest temperatures during the month were below those generally attained in October, while the lowest were about the same. The former occurred on the 1st, and most of the latter on the 10th, although several stations report other dates. The highest recorded were: Columbus, 74; Pittsburgh, 73.8; Beaver, 73; Charlesville and New Castle, 78. The lowest were: Clarion, 19.2; Greenville, 20.5; Coudersport, 21; Dyberry, 22; and Honesdale, 23. The means of the daily maximum and minimum from fifty stations are, respectively, 54.7 and 38.0. These give a mean of 46.3, which differs only 0.2 from the mean (46.1) derived from the tri-daily observations.

Precipitation.—The average rainfall over the state for the month was 4.02, which is an excess. Very few heavy rainfalls occurred, but the days on which

rain fell were so numerous that the month has been unusually wet and disagreeable. The percentage of humidity ranged high, and there was more than the usual number of cloudy days. A few snowfalls were reported, but they were light. The greatest was one inch, at Somerset.

Wind.—Prevailing direction, northwest.—*Under direction of the Franklin Institute, Philadelphia; T. F. Townsend, Sergeant, Signal Corps, assistant, in charge.*

SOUTH CAROLINA.

Summary.

Temperature.—Mean of the state, 59.8; highest monthly mean, 66.2, at Timmonsville; lowest monthly mean, 53, at Cedar Springs; maximum, 88, at Branchville, 6th; minimum, 31, at Cedar Springs, 21st. In a majority of instances the maximum occurred the 6th, and the minimum the 1st and 20th.

Precipitation.—The mean depth of rainfall was 4.18, while the record for October, 1887, shows a mean depth of 5.96. The greatest amount of precipitation occurred at Allendale, where a fall of 7.83 was recorded for the month, and the least at Chesterfield, where 2.34 fell.

Wind.—Prevailing direction, southwest.—*Hon. A. P. Butler, Columbia, director; H. C. Seymour, Private, Signal Corps, assistant.*

TENNESSEE.

There were no special features during the month except the low temperature mean and the large percentage of cloudiness and proportion of rainfall.

Summary.

Temperature.—The mean temperature was 54.6, nearly four degrees less than the October mean of the past six years, and the lowest during that period, except in 1885, when it was about the same. The highest local mean was 57.5, at Covington, and the lowest, 51.4, at Rogersville and Springdale. The maximum was 84, at McKenzie, 1st, and the lowest October maximum during the past six years. The minimum was 29, at Lawrenceburgh, 14th, and was the highest October minimum recorded in the period above named. The maximum temperatures were generally recorded about the 1st and 18th in the western division, and about the 18th and 19th in the other divisions, and the minimum about the 14th and 21st in the western division, and about the 14th, 21st, and 29th in the middle division, and the 21st and 29th in the eastern division. The daily ranges of temperature were generally less than normal. There were three cold-wave warnings sent out during the month, viz., 2d, 5th, and 19th, two of which, the 2d and 19th, were verified, and proved of inestimable value throughout the state to farmers, stock-breeders, florists, and gardeners. The warning of the 5th was not fully verified. On the 28th and 29th a cold wave occurred for which no warning was given. At Nashville the temperature fell from 61 on the 28th to 38 on the 29th.

Precipitation.—The mean depth of rainfall was 4.06, most of which fell during the latter half of the month. From the 19th to the 28th, inclusive, there were almost constant rains, some of them very heavy, particularly those of the 19th, throughout the state, and the 26th and 28th, mostly in the eastern division. Of the total amount which fell during the month the eastern division received by far the greater proportion, an average of nearly 6.00, while the middle division received an average of 3.25 and the eastern division about 3.00. The greatest rainfall reported was 7.22, at Andersonville, and the least, 1.40, at McKenzie. The greatest local daily rainfall was 3.00, at Fostoria, 26th; the next, 2.06, at Waynesborough, 19th, and 2.00, at Andersonville, 26th. From the 1st to the 15th the rains were generally light. The 19th was the day of the greatest rainfall. There were nine days on which no measurable rainfall was reported. Frosts were reported on about nineteen days, those of the 4th, 14th, 21st, and 29th being killing frosts, the others light.

Wind.—prevailing direction, northwest.—*J. D. Plunket, M. D., Nashville, director; H. C. Bate, Signal Corps, assistant.*

TEXAS.

Summary.

Temperature.—Average for the state, 67.4; mean maximum temperature, 79.4; mean minimum temperature, 57.8; highest temperature reported, 98.8, at Rio Grande City, 21; lowest, 33.8, at Mesquite, 24th; absolute range, 60. The greatest monthly range of temperature was 56.2, and the least, 31.2. The average range of temperature along the coast was 34.2; in the interior, 48.2; and for the state, 46.8. At thirteen stations the minimum temperature was below 40 one day during the month. At Fort Elliott there were nine days on which the temperature reached 40 or below, and at Weatherford six days.

Precipitation.—The average rainfall for the state was 2.03. This amount is considerably below the average for October. Probably not in any October in many years was the deficiency in rainfall to be less regretted, as the cotton crop was late, and required good weather to mature it. The greatest amount of precipitation in any twenty-four hours at any station was 3.04 at Galveston, on the 22d. The greatest monthly precipitation, 5.67, also occurred at Galveston. Except at Weatherford, where no rainfall was recorded, the least monthly precipitation, 0.50, occurred at Dallas. Amounts exceeding 3.00 fell at Austin, 4.45; Galveston, 5.67; Houston, 4.92; Sour Lake, 4.50; and less than 1.00 fell at Weatherford, 0.00; Dallas, 0.50; Fort Elliott, 0.85; Mesquite, 0.63; San Antonio, 0.85; Tyler, 0.75; Waco, 0.60.—*S. O. Young, M. D., Galveston, director; Allen Buell, Sergeant, Signal Corps, assistant.*